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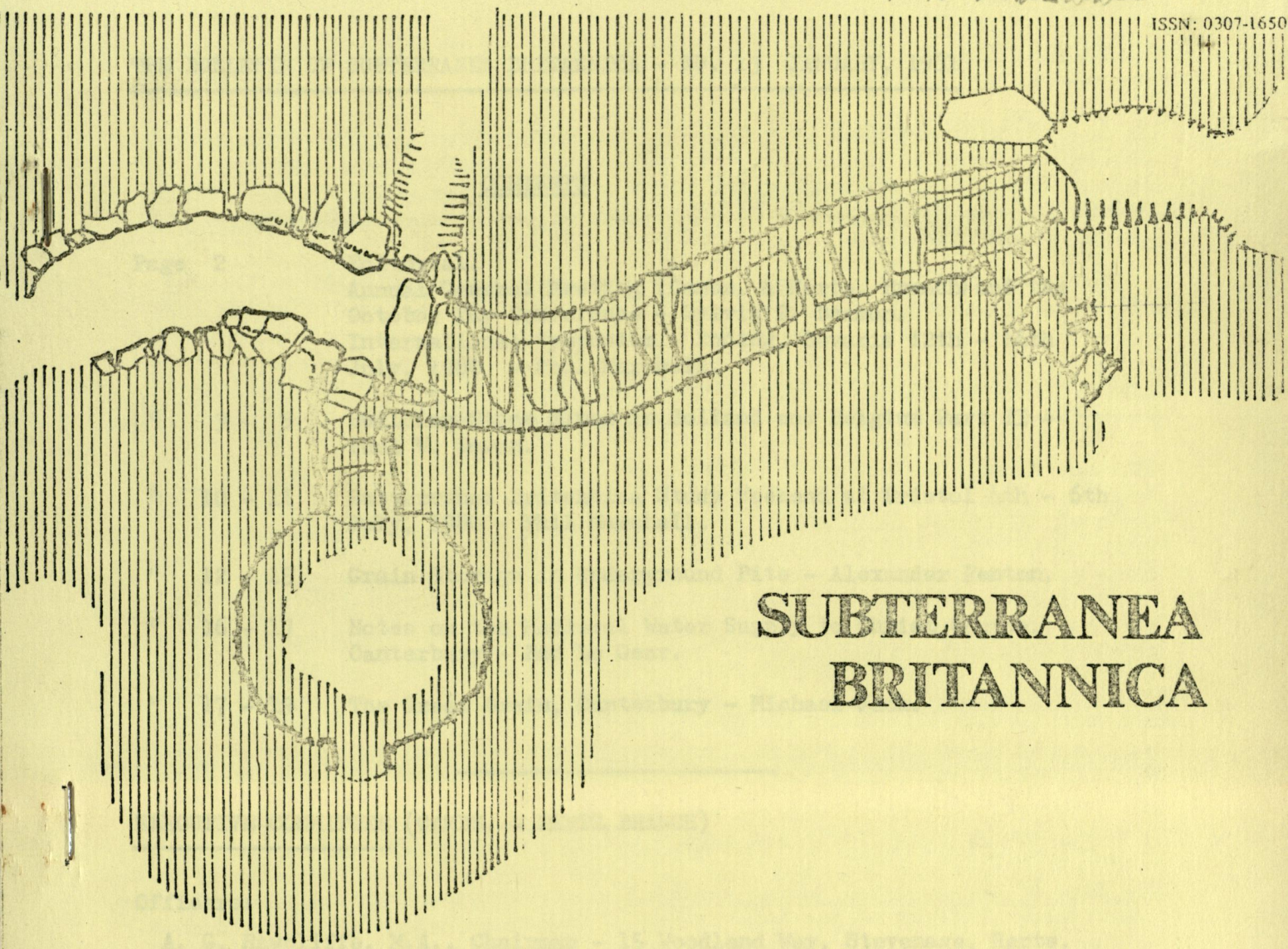
ISSN: 0307-1650



SUBTERRANEA BRITANNICA

Bulletin No. 13

Compiled and published by
Subterranea Britannica

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This Bulletin is the official publication of the Federation of Subterranea Britannica, but is edited, published and distributed by the Cambs. and Herts. Branch.

Subterranea Britannica is in association with Société Française D'Étude des Souterrains of France, Arbeitskreis für Erdstallforschung of Germany and La Société Belge D'Étude des Souterrains of Belgium.

Bulletin compiled by Sylvia P. Beamon.

EDITORIAL

It is with pleasure that we welcome to the Federation, the West Sussex Geological Society, South Wiltshire Industrial Archaeological Society, Purbeck Industrial Archaeological Group and the Dudley Canal Trust. The Federation continues to grow and the range of its interests and connections is satisfactorily wide.

THE EDITOR

ANNUAL GENERAL MEETING (CAMBS. & HERTS. BRANCH) AND THE OCTOBER DAY CONFERENCE

Mr. Paul Sowan, Secretary of the Federation, took the Chair at the Annual General Meeting of the Branch which was held at 'Strathaird', Lucy Cavendish College, Cambridge on Saturday, 18th October, 1980. The business was formally conducted. Dr. John Alexander had resigned from the Committee due to heavy commitments but was prepared to continue assisting with the Bulletin; this was gratefully accepted by the Branch. Mr. Tom Doig, although unable to be present on this occasion, was elected onto the Committee. The remaining Committee members were elected nem. con.

The meeting continued with the following papers:

Underground Structures of Southern England was the original title, but Mr. Harry Pearman, Librarian for the Chelsea Speleological Society, always an amusing and interesting speaker, widened his talk to include slides of the Catacombs in Rome, scenes under Paris and others within the Great Pyramid.

The Work of the National Caving Association was discussed by Mr. Peter Mellors, Conservation Officer of the Association. The Association is concerned with natural caves but particularly on conservation matters, is equally concerned with man-made underground structures.

SYLVIA P. BEAMON.

INTERNATIONAL SYMPOSIUM ORGANISED BY ARBEITSKREIS FÜR ERDSTALLFORSCHUNG AT RODING, BAVARIA, 12TH - 14TH JULY, 1980

A total of 123 persons from six different countries came to the Symposium, those from Great Britain being Phil Marshall and the Beamon family, and from Ireland Paul Gosling and Julie Tollerton. The four days were a pleasant mixture of eating, drinking, visiting souterrains and listening to the experiences of people from the various countries. Papers given included Souterrains in Ireland, Survival in a Souterrain (an experiment), Ice Storage, Souterrains (Erdstalle) of Bavaria. The Symposium was conducted almost entirely in French and German.

Visits included one to Reichersdorf, in which a number of men could have taken refuge - a window in the side of one chamber led into the side of a well shaft - presumably so that food could be secretly passed to those taking refuge. Goetzlhof which had five separate chambers at different levels; there appeared to be other entrances, now blocked-up, and the connections between these chambers may have been after their construction. Another type of souterrain consisted of a passage with another leading off at right angles, going vertically for about 4 ft.(1.219 m.), then curving round back towards the main passage, rejoining it via another 'shaft'. Cont'd on p. 18.

BUILDING - STONE MINES in the UPPER CRETACEOUS in HOLLAND and BELGIUM : PART II

Paul W. Sowan

Continued from Bulletin 12 (1980), pages 3 - 9

Dating the Mines

Eef Smitshuysen (pers. comm.) tells me that it is suspected, from architectural evidence, that quarrying started in earnest ca. 1200 to 1400; and that almost all houses built from 1400 into the present century contained the mined stone, if only in foundations or internal walls. Jacques Diederen (pers. comm.) confirms this, and has additionally made a study of working techniques and graffiti in the Valkenburg Gemeentegrot ('municipal quarry'). Because of the multi-stage method of working this and most of the other mines, the oldest evidences of working techniques, and the oldest genuine graffiti, tend to be very high up near the ceilings, which effectively protects them from interference but renders them peculiarly difficult to reach for photography or study! However, the Gemeentegrot does shew a wider range of working technique traces than is usually encountered, including clear evidence for the use of picks in some of the oldest parts, the markings shewing how the tool swung, and graffiti from as early as 1513, or earlier. Datable artefacts within the mines are evidently few and far between - as so often in England. It is presumably a consequence of their being a nation of cigar smokers that the Dutch have left so few clay tobacco pipes underground! Some coins as old as 1500 have been reported, but all such finds are of limited value in the absence of continuous and sequential stratified burial; they serve only to indicate a possible minimum age. And naturally any multi-stage working, where the floor has been taken up throughout the mine as many as four times in succession, will have played complete havoc with any artefacts, stratified or not, from the earliest period of working, for which period graffiti and tool-markings on the ceilings and the highest parts of the walls must suffice for dating. There is, too, the fact that the oldest working areas will necessarily have been closest to the entrances, and thus subjected to the highest concentrations of traffic and maximum risk of alteration during the active life of the mine and for as long afterwards as the entrances remain open.

Secondary use of the Mines

The usual range of secondary uses is found. Mushroom and endive growing may have led to the making of the wells and shafts to the surface found in some of the mines. The circular shafts in the ceilings are far too small to have been of any use in hauling stone blocks, but might have been points of exit for mushroom crops or possibly just for ventilation although the mines contain such large bodies of air apparently relatively free to circulate that it seems improbable that this was necessary.

Maastricht was a fortified town, with its own intricate network of subterranean defence works around the perimeter, and additionally was commanded by Fort St. Pieter (1700) which has its own intriguing history (Notermans, 1980) of underground works and connections with the mine tunnels below. Not surprisingly, attempts were made to penetrate the fort and to blow it up from below! So near as it is to the meeting point of three countries, St. Pietersberg and its mines (which formerly extended uninterruptedly into Belgian territory) has also figured largely as a wartime refuge (features and graffiti from a number of periods bear witness to this) and in tales of smuggling. The 'smugglers' hole' claimed to have been the only way through from the northern (Dutch) end of the St. Pietersberg system the full 4 km to the neighbourhood of Caster, the former castle above Klein Ternaaien, in Belgium, may possibly have been a

proof-tunnel; or perhaps it was deliberately made for smuggling. If the smuggling interpretation can be substantiated, the mobility of the international frontier (Belgium formed, at different times from the 15th century, a part of the dominions of Austria and Spain and was, in 1795, conquered by the French; at the peace of 1814 it was joined with Holland, with which country it continued in union until it gained independence in 1830) might be of assistance in dating this part of the workings.

Nomenclature

The stone from the mines is known locally as 'mergel', although this word does not have the same connotation as the English equivalent 'marl'. More formally, in geological terminology, it is a variety of 'kalksteen' or limestone. Flint, in Dutch, is 'vuursteen', which translates as 'firestone' on account of its former use for striking sparks and starting fires. A stone-quarry, in this context, is a 'mergelgroeve', although as there are now several very large open quarries being worked in the district for cement production, it is safest to call the stone-mines 'onderaardse mergelgroeven' or 'onderaardse steengroeven' (underground marl or stone quarries). As in England, some of the underground quarries, especially perhaps those which are tourist attractions as the Gemeente-grot at Valkenburg, are popularly called 'grotten' (caves). The term 'mijn' (mine) is applied to the Rijckholt-St. Geertruid flint-mines, or 'vuursteen-mijnen', and to the former deep coal-mines (kolenmijnen) at the nearby towns of Heerlen, Eygelshoven, and Kerkrade. All of this is guaranteed to lead to some initial confusion when discussions are entered into with Zuid-Limburgers comparing the Dutch stones and mines with our own underground firestone quarries in Surrey, hearthstone mines, flint-mines, chalk-mines, chalk-pits, and chalk-quarries (underground)(valid and important distinctions), chalk-wells, deneholes and even sand-mines which several Dutchmen professed to believe to be impossible!

The tools most in evidence, from their markings left in the mines, are the 'zaag' (saw), 'beitel' (long chisel) and 'houweel' (pick); the stone is generally too soft for there to be any call for the 'wig' (wedge) or the 'breekijzer' (crow-bar).

Conservation and Access

A number of the larger mines are quite open, especially those just inside Belgium. Their sheer extent safeguards them to an extent - those who are equipped with lights and brave enough to launch out into the maze (right- or left-hand walling isn't very practicable in a vast expanse of isolated pillars unless one positively revels in the least attractive and most dangerous areas around the perimeter!) are soon distributed throughout a large area. The brightest lights possible are recommended (the Dutch use 'Tilly lamps') - it could well be 14 m up to the ceiling - and good photography, especially of the all-important first-stage ceiling and wall areas is exceptionally difficult. As already remarked, the sheer height of the galleries very effectively protects the oldest parts from interference, or even observation. Helmets are not needed, with ceilings this high; only very occasionally is it really necessary to crawl through tight places, and for much of the mines a bicycle would be a distinct, if novel, item of caving equipment! The men working in the mine at Sibbe (a single-stage mine) drive in and out by car! One or two of the huge cavernous entrances in the wooded slopes above Klein Ternaaien (Petit Lanaye) are half-heartedly barred by 1.5 m high brick walls, or sport 'verboden toegang - dood gevaar' notices (also in French). A number of tools and photographs, as already said, are preserved in the district museum at Valkenburg; and more are kept in a locked and limited-access 'museum' in the, in-turn limited-access locked mine at Louwberg which is shared with NATO personnel between the river Jeker and the Albertkanaal, south-west of Maastricht (the Cannerberg mine). Access to this mine does appear to have been effectively

restricted to responsibly organised groups who can be trusted to respect the artefacts, as well as the bizarre museum of modern carvings and elaborate charcoal drawings adorning the temptingly smooth walls. NATO has annexed the southern end of the system, walling it off securely, and constructed a secure modern tunnel entrance to the rest of the mine which authorised visitors are able to share (as at Box in Wiltshire) with the tail end of the military ventilation system!

There has been much research and careful thought devoted to the study and conservation of bat populations, too, Stebbing's paper on the Ge lhemergroeve (between Valkenburg and Maastricht - securely gated as a bat reserve and emphatically to be respected as such) has already been mentioned. Further information on bat research in the district has been published, for example, by Bels (1952), van Nieuwenhoven (1956), Punt (1973), Punt & Parma (1964), and Sluiter & van Heerdt (1968). As in England, visits, especially to the smaller mines where disturbance during hibernation is most likely to lead to arousal and possible death from consequent depletion of fat reserves, should be restricted to the period May to September.

A very real and major threat to bats and mines alike is posed by the cement industry. The slightest acquaintance with Netherlands geography and geology will underline the fact that these limestone hills in Zuid Limburg constitute a vital source of lime for cement for the further expansion of Rotterdam and other such places. ENCI, the First Netherlands Cement Industry company, has an enormous open quarry which now almost cuts entirely through St. Pietersberg - revealing the mine galleries in section all around the quarry faces, demonstrating just how thoruoughly the entire hill was mined from end to end and side to side. Thus has the Slavante system (named after the 15th century monastery built, very probably of the local stone, nearby) been virtually obliterated; and the quarrying is now encroaching on the Zonnenberg system's inner recesses - much more mine will be lost. As some sort of dubious compensation for quarrying away most of the middle of one of Holland's all-too-rare hills, and arguably the most interesting of them all (of considerable natural history interest as well), ENCI has piled the stripped-off overburden into an artificial 'mountain' on top of the remainder of the hill southward towards Belgium; this great mound, called ENCI-bos, has been afforested and provided with tracks, seats, and a look-out point at the summit. This extraordinary excrescence quite fails to blend in sympathetically with the genuine Dutch hill-country surrounding it - the view across the Maas from the train via Eijsden and Vise to Liege (Luik) is particularly incongruous! The great mass of this artificial mountain has caused the large area of mines below it to cave in, and thus a further several kilometres of these fascinating workings have been lost before they could be properly recorded, dated and understood. Entrances have been very effectively back-filled (as effectively as only a cement company could do the job!), and the underground access under the border from Belgium walled-off underground. The appearance of a small but convenient hole in this wall will be no surprise to members of the caving fraternity!

Whereas effectively unfestricted access to some large mines is possible on the Belgian side of the border, things are more controlled in Holland. There are at least three Dutch 'shew caves' - the Noordelijk stelsel (northern system) and stelsel Zonnenberg (although there isn't much sunshine underground!) excavated into the northern end of St. Pietersberg, between Maastricht and the ENCI open quarry and cement works just short of the Belgian border; and the Gemeentegrot (municipal cave) at Valkenburg. The two St. Pietersberg systems were formerly co-extensive, but are now almost if not completely separated by a large zone of roof-falls ('instortinggebied'). Zonnenberg used to connect through the Slavante and Castert systems to the Ternaaien mines in Belgium. The two public-access systems have extensive, impressive, and sometimes genuinely quite old graffiti and occupation-relics. They are well worth visiting.

The most 'sophisticated' (in the worst sense of the word) 'shew-cave' is the Gemeentegrot at Valkenburg - right in the centre of the town which is Holland's reply to Southend, and more often than not alive with depressingly uncivilised English school tours! The Gemeentegrot should not be confused with the tourists' mock-up coal-mine and sundry other subterranean attractions. In spite of its coloured lighting, its decorations, and its carved extinct monsters (mosasaurus, the original of which is now in Paris, was first discovered in the St. Pietersberg mines and named after the Maas), and elaborate charcoal graffiti, the parts of the mine visited during the guided tour are amongst the most interesting, provide a number of contrasts in working methods with other mines, are quite certainly at least as early as the 15th or 16th centuries, and are very well worth seeing if only as a tourist.

Two last points concerning the mines, townscape and landscape of this part of Holland and their conservation are worth adding. Responsible opinion in the province is jealous of the scenery (quite unlike that of the rest of the country) provided by the rolling farmland and wooded hills with their mysterious caverns - and most especially so in Jekerdal, which runs around the back (west) of St. Pietersberg. If the ENCI quarry is allowed to cut right through from the Maas valley to Jekerdal, the gentle and partially wooded skyline and sceneryof Jekerdal will suddenly have thrust into it a view across an immense and unattractive quarry full of heavy plant, and a very large cement works. It seems likely that the same sort of skyline protection as was attempted at Wenlock Edge will be resorted to here - the company will be required to leave land up to the skyline to create the illusion that the whole solid hill remains. It still won't be the same, knowing it to be a sham. The ENCI-bos artificial mountain has irrevocably damaged the skyline anyway; and the Slavante-Zonnenberg mine systems will become mere memories.

The appearance and standard of new buildings, repairs and extensions, in this landscape, too, are closely controlled by local planning regulations. In and around Valkenburg it is generally necessary to have such work executed, in important locations, in the characteristic creamy-yellow local stone. Expensive as it now is to extract from the depths of the hill under the village of Sibbe, it is this residual demand which keeps the last few miners at work.

Comparisons

Comparison of the Maastrichtian limestone mines and their products with others at Caen (Lower Normandy), Chaldon/Merstham (south-eastern England), Chilmark (Wiltshire), Portland (Dorset) and Box/Bath (Wiltshire/Avon) is instructive, and reveals at once that in a number of respects there is little similarity. Maastricht, Caen, Chilmark and Chaldon/Merstham had quite certainly become of some importance by the Middle Ages, if not before - the Maastrichtian stone simply because it was so readily available and readily worked that it was used, in its own district, as timber-framing and, later, flint or brick were in vernacular architecture in south-eastern England. Caen stone was valued by the Normans, in Normandy, for fortifications and church-building - from William's castle at Caen onwards. It was found ideal, too, for the wonderful Romanesque, and later, churches erected in that city. After the conquest of England, our own predominantly wooden-palisade native defences, and our probably numerous wooden Saxon churches, gave way to stone buildings on a scale which probably surpassed that seen during the earlier Roman occupation. London and the south-east are almost devoid of sound and tractable stone, and it was not found inordinately expensive, for works of the first importance, to bring Caen stone from Normandy to convenient points around the coast, or up via the Thames. It was even used in the Cathedral at Norwich. The progressive elaborati of carved ornamentation reinforced this demand for Caen stone which, as an excellent freestone, proved eminently suited to intricately carved decoration

- a fact amply demonstrated in the 13th-16th century Eglise St. Pierre in Caen itself. The river Orne formerly had a branch flowing immediately past some of the old quarry sites within the city centre, so facilitating the freighting of stone to England as well as up and down the French coast. English rule of this part of France on and off in the 14th and 15th centuries doubtless was also a consideration.

From later Saxon times, in a small way, an inferior but native stone was being worked in Chaldon and Merstham in Surrey - an awkward 30 km or more over the North Downs escarpment and dip slope to the Thames and London where most of these underground quarries output, firestone (or Chaldon or Reigate stone), was used. After the conquest its use expanded considerably, and we find it mentioned in large quantities in Medieval building accounts for most of the more important buildings of those times. Presumably, despite the long, difficult, and thus expensive overland journey from quarries to London, it was used as a cheaper substitute for Caen stone, with which it was in direct competition as a freestone for carved work. It would be interesting to be able to establish if Caen's changing hands, and finally being lost by the English in 1450, was reflected in the availability and use of its stone or demand for its English substitute. Not only in the matter of freighting, but also in respect of geological conditions underground was Caen stone altogether easier to work and transport. I have described the Surrey quarries elsewhere (1976).

In the quarries at Chilmark, some 18 km west of Salisbury, we have a further example of inland quarries whose stone was largely destined to be laboriously hauled considerable distances overland (or perhaps to an extent rafted down barely adequate streams) for incorporation in distant Medieval buildings.

Maastricht's stone, by contrast, in spite of the vast extent of the abandoned underground quarries from which it was taken, appears almost always to have been used in its immediate neighbourhood for vernacular architecture; and the opportunity presented by the Maas for wider distribution appears not to have been taken.

With the rebuilding of much of London after the great fire of 1666, though, it was to Oxfordshire and Portland that attention was directed for such stone as was required (most of the rebuilding, of course, was in brick) which could, so much the better, be conveyed by water all or most of the way to the building sites from the quarries.

Bath, Box and cognate stones were used in a small way by the Romans (demonstrably true from extant architectural remains, at least at Bath if not at the villa at Box, for once!), although it is not known if they worked it opencast or underground. But this stone had to await the 18th century rejuvenation of Bath as a fashionable spa before it started to deserve its present fame as one of England's most important building materials. The opening of the Avon navigation to Bristol in 1727, the completion of the Kennet & Avon Canal in 1810, and the opening of the Great Western Railway through Box Tunnel in 1841 (leading to the exploitation of the huge reserves of stone thus proved to exist between Corsham and Box) all combined to make the later part of the 19th century the peak period of activity and extension in these quarries. The Portland quarries are noticed, in passing, by Bettey (1970) and at greater length by Edmunds & Schaffer (1932), and those around Bath, and their products, in rather more detail by Hudson (1971), Tucker (1969), Perkins, Brooks & Pearce (1979), Tucker, Bater & Mansfield (1969) and Huggins & Pickford (1975).

Thus all of these stones, of which even Portland was at times worked underground (as at the Seacombe quarry, Worth Matravers, in Purbeck), rose to importance or fell out of use at quite different periods; were transported in radically different ways; differed widely in the distances they were found worth taking from their sources; went into buildings and parts of buildings ranging from pig-yard walls (Maastricht) to Palaces (Chaldon) and will no doubt on close

inspection below ground prove to have been worked by many and diverse means. Geological conditions underground in the quarries vary from straightforward and favourable, as at Caen and Maastricht, to decidedly difficult as at Merstham where inclined strata, the water-table, and only thin seams of sound stone are the rule. Likewise the geographical context of quarries, transport routes and market areas - with, again, Merstham/Chaldon and Chilmark heavily disadvantaged by inland locations and lack of navigable waterways. No doubt extension of this research to some of the numerous other important English and continental quarrying districts will reveal differences again.

Nevertheless, it is suspected that the whole tradition of going underground for building-stone must have arrived in England, and in the Low Countries, by way of France, from Rome and Greece. It is proving disappointingly difficult to locate Frenchmen interested in, or knowledgeable about, the numerous carrieres souterrains known to be scattered throughout France. And, correspondingly, although Roman and Greek metalliferous mining appears to be relatively well documented and researched, little appears to have been placed on record concerning the rather simpler techniques which must surely have been employed in antiquity to extract all the stone required for the great monuments of those times from, at least at times, drift mines.

Acknowledgements

The observations in Holland and Belgium reported here would not have been possible without the magnificent assistance, with information, with accommodation and with transport, and in the field (or under it) of Speleo Nederland (Nederlandse Vereniging voor Grot- en Karstonderzoek), Afdeling Limburg; and especially of Eef Smitshuysen, Jacques Diederen, Emanuel Smeets and Hr. A. Terpstra-Lindeman. I am indebted to Jacques Diederen for the photograph used in the first part of this paper. I am also indebted to Tony Seaton for assistance with translation from French.

References

Bels, L. Fifteen years of bat banding in the Netherlands. Maastricht : Publicaties van het Natuurhistorisch Genootschap in Limburg 5, 1-99. 1952.

Bettey, J.H. The Island and Royal Manor of Portland. Some Aspects of its History with particular reference to the period 1750-1851. Portland : The Court Leet of the Island and Royal Manor of Portland, in association with the University of Bristol Department of Extra-Mural Studies. 155 pp. 1970.

Bonnetantenmuseum. Vuursteenmijnbouw in de prehistorie. Maastricht : illustrated brochure issued by the museum in connection with an exhibition devoted to prehistoric flint-mining, at Rijckholt and Grimes Graves. 1975.

Edmunds, F.H., & R.J. Schaffer. Portland stone; its geology and properties as a building stone. Colchester : Proceedings of the Geologists' Association 43, 225-240. 1932.

Felder, P.F., & P.C.M. Rademakers. Opgraving van prehistorische vuursteenmijnen in Ryckholt-St. Geertruid. Een overzicht van de bereikte resultaten. Maastricht : Natuurhistorisch Maandblad 62(5/6); 14 pp. offprint. 1973.

Fourmarier, P., & L. Denoël. Geologie et Industrie Minerale du Pays de Liege. Paris & Liege : Librarie Polytechnique Ch. Beranger, p. 235. 1930.

de Grood, E., & H. Hillegers. Van Pötsjesjtoete en Ratnakke. Techniek en Gevolg van de Onderaardse Mergelwinning. Maastricht : Natuurhistorisch Museum, 16 pp. nd (? 1970s).

Hudson, K. The Fashionable Stone. Bath : Adams & Dart, p. 56 et seq. 1971. [Bath, Box, and cognate stones]

Huggins, G.M., & R.F. Pickford. Bath Stone. A Short History. Bath : Geological Museum, 16 pp. 1975.

Kellenaers, P. Wat er Overblijft van de St. Pietersberg. np (? Maastricht), 40 pp. nd (? 1970s). [Illustrated account, with plan of Noordelijk stelsel and stelsel zonnenberg etc under St. Pietersberg]

de Martynoff, A., & F. Lambert. La Belgique Souterraine. np, Guides Vokaer, nd (? 1976).

van Nieuwenhoven, P.J. Ecological observations in a hibernation-quarter of cave-dwelling bats in South-Limburg. Maastricht : Publicaties van het Natuurhistorisch Genootschap in Limburg 9, 55 pp. 1956. [Experiments and observations conducted in the small Apostelhoeve mine in Jekerdal]

Notermans, J. Fort St. Pieter. Maastrichts Silhouet. Maastricht : Stichting Historische Reeks Maastricht, 24 pp. 1980.

Pannekoek, A.J. Geological History of the Netherlands. 's-Gravenhage, pp. 51 & 53. 1956.

Perkins, J.W., A.T. Brooks & A.E. McR. Pearce. Bath Stone. A Quarry History. Department of Extra-Mural Studies, University College, Cardiff, in association with Kingsmead Press, Bath, 54 pp. 1979.

Punt, A. Vleermuis-reservaten, een taak voor Zuid Limburg. Maastricht : Natuur-historisch Maandblad 62(9), 110-114. 1973.

Punt, A., & S. Parma. On the hibernation of bats in a marl cave. Maastricht : Publicaties van het Natuurhistorisch Genootschap in Limburg 13, 45-59. 1964. [Observations in the small Kloostergroeve mine at Berg en Terblijt]

van Schaik, D.C. The Old Town of Maastricht and the Caves of Mount St. Peter. Heer : published by the author, 47 pp., illus. with plan. 1945.

van Schaik, D.C. Maastricht en de Sint Pietersberg. Heer : published by the author, 56 pp., illus. with paln and bibliography. 1948.

Sluiter, J.W., & P.F. van Heerdt. Les Chauves-Souris de la Region Frontiere Belgo-Neerlandaise. Maastricht : Publication de l'Association "Commission Scientifique Belgo-Neerlandaise pour la Protection de la Montagne St. Pierre" no. 9, 34 pp. 1968.

Smith, P. The limestone mines of Maastricht, Holland. Orpheus Caving Club : The Lyre 3, 34-36. 1959.

Sowan, P.W. Firestone and hearthstone mines in the Upper Greensand of east Surrey. Colchester : Proceedings of the Geologists' Association 86(4), 571-591. 1976.

Stebbings, R.E. Bat protection and the establishment of a new cave reserve in the Netherlands. Studies in Speleology 2(3/4), 103-108. 1971.

Tucker, R.J. Box Quarries, Wiltshire. Industrial Archaeology 5(2), 178-183 + plate on p. 151. 1968.

Tucker, R.J., R.J. Bater & R.W. Mansfield. Box Stone Mines. Memoirs of the Cotham Spelaeological Society 4, 5-29. 1969.

Ubaghs, C. Description Geologique et Paleontologique du Sol du Limbourg. Roermond : J.J. Romen et Fils, pp. 93-97. 1879.

van Wijngaarden, A. Ons krijtland Zuid-Limburg. III. De onderaardse kalk-steengroeven in Zuid-Limburg. Wetenschappelijke Mededelingen van de Koninklijke Nederlandse Natuurhistorische Vereniging 71, 1-28. 1976.

A total of 23 people came to Bristol for the Study Weekend, which looks like becoming an annual event !

Participants gathered in Clifton early on Saturday morning to visit the Clifton Rocks Railway Tunnel. This was originally constructed in 1893 for an underground funicular railway which ran between Hotwells Spa and Clifton Heights. It ceased to run in 1934 and the tunnel lay disused until 1940 when it was converted into an air-raid shelter, and studios for the B.B.C. Little remained of the funicular, though in places the rails could be seen. The crumbling remains of the B.B.C. studios were treated with caution.

We then walked over the Suspension Bridge, from which the lower entrance to the funicular could be seen in the cliff face also the site of the Bristol Port and Pier Railway terminus. Visiting the Clifton Observatory we hoped to see the small tunnel which was dug from there to a cave in the cliff face, but rebuilding of part of the observatory made access unsafe at the present time. We did however, see the 'Camera Obscura' which was unaffected by the building work.

Proceeding to Goldney House, again in Clifton, the grotto there was opened up for us. Those who came to Ironbridge last year will remember Abraham Darby, the Quaker ironfounder. Thomas Goldney of Bristol provided the money for Darby to set up the foundry at Coalbrookdale and also acted as agent and salesman for the firm, managing to still his Quaker concience when taking orders for guns needed in the war against Spain in 1739. Work on the grotto was started in 1737 and was completed in 1764. Some of the shells were collected by the Goldneys on their voyages of exploration over the years, others may have been given to them. The quarry tiles for the floor came from the Dale brick and tile works, Coalbrookdale. In 1764 a tower was built in the grounds near the grotto. This provides a good view of the surrounding country but its main purpose was to house the steam engine which pumped water from a well to the fountains in the ornamental pool and the cascade in the grotto. This also came from Coalbrookdale.

There was then a couple of hours break in which to take lunch and get across the centre of Bristol to Redcliffe. Some took the opportunity to visit the SS Great Britain (presently being restored), others to recover lost car keys ! Most paid a visit to the 'Ostrich' built against the sandstone cliff close to Redcliffe Caves. It appeared to extend back into the cliff a little way, but this area was not accessible to us.

Redcliffe Caves are at least 300 years old, and their original use is uncertain. It has been suggested that the sand was used for glassmaking, and glass was certainly made in Redcliffe. They were later used for storage. The caves were lit with propane gas lights for our visit. Throughout the caves low pillars of sandstone support the roof. In places wells have been sunk from the surface which go right through the cave system. A circular wall of stone has been built for each well from floor to ceiling, in one case a 'window' being left which enabled us to see into the well.

Medieval cellars near the old city gates at Bristol Bridge were opened up for us, also the old Charnel House under St. Nicholas Church (now a museum). The site of Bristol Castle was shown to us, and the old moat, now roofed over but still carrying water.

On Saturday evening participants described and discussed the following underground structures which they were acquainted with:

Dudley Canal Tunnel and associated mines (Martin Guest)
Maastricht Stone Mines (Paul Sowan)

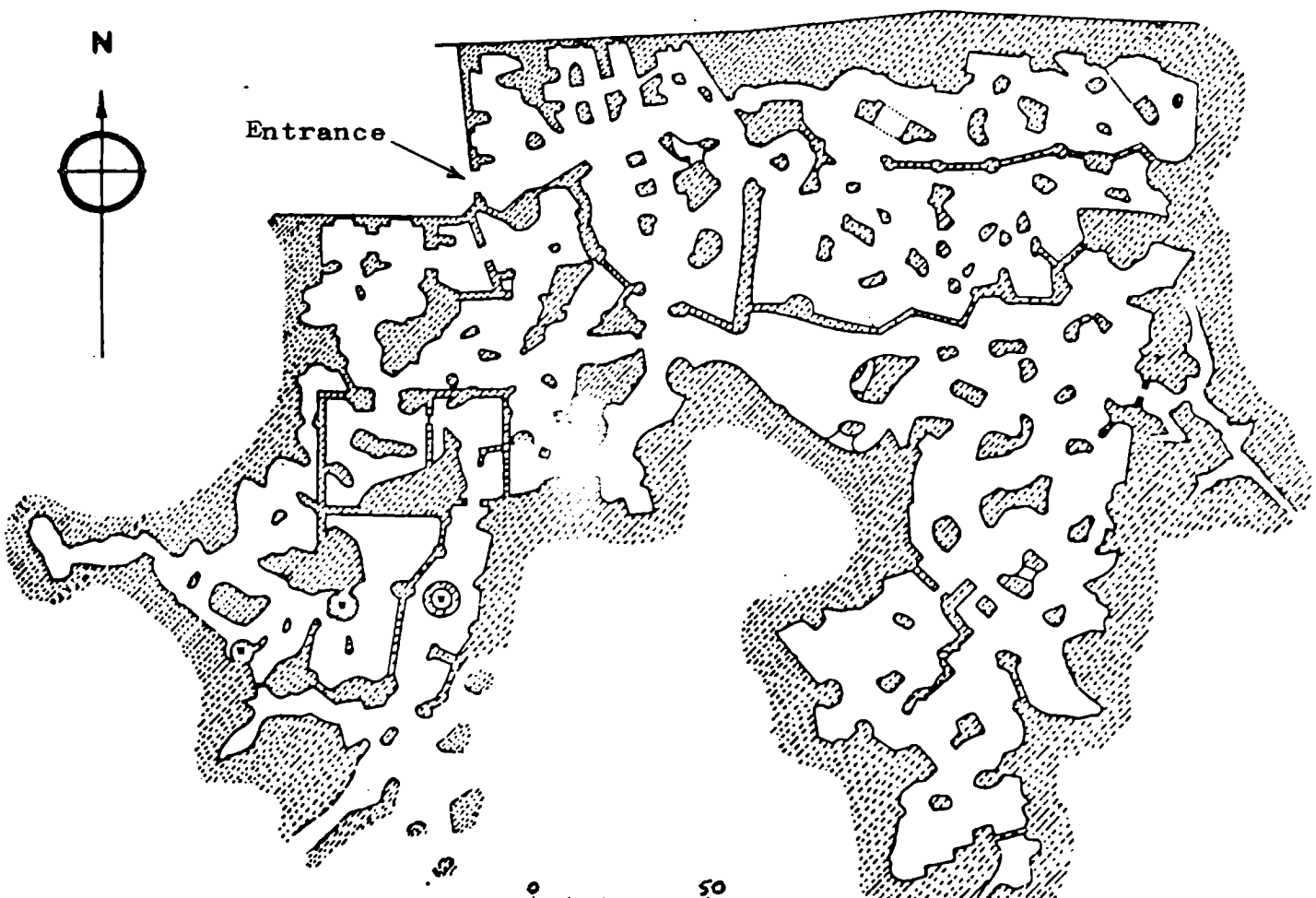
R.A.F. Uxbridge Underground Control Centre (Roger Morgan)
Channel Tunnel, also West Wycombe Caves (Michael Jack)

The whole of Sunday was spent visiting the Bath Stone Quarries, the first visit being to Monks Park mine near Corsham which is still working. Mr. Tommy Brooks the manager, demonstrated ancient and modern methods of winning the stone, and showed us his museum containing many artifacts and photographs. Entry to the mine was via a slope shaft, there being 90 ft. (32.296 m.) of cover over the Bath Stone beds at this point.

Moving to Box Hill, the stone beds outcropped in the hillside above Box village, and there were a number of entrances to the mine workings, many of which have been backfilled in recent years. Features noted in Box included dry-stone walling and archways where the roof was badly faulted, also the remains of cranes, wagons and narrow gauge track for transporting the stone, stone saws, files and other tools used in winning the stone. It was apparent that the stone was much more faulted than Monks Park, resulting in the pillars supporting the roof being much closer together, and large quantities of 'deads' or waste stone which was unsuitable for use in building. Also it was necessary to climb over a number of roof falls which blocked the way.

Late on Sunday afternoon participants emerged from the darkness and, after agreeing that an excellent weekend was had by all, went their separate ways.

PHIL MARSHALL



REDCLIFFE CAVES.

Scale 1:600

DIARY DATE: Subterranea Britannica Study Weekend, Reigate, Surrey, 26 - 28th June, 1981 - Further details from Sylvia P. Beamon, 16 Honeyway, Royston, Herts.

GRAIN STORAGE IN UNDERGROUND PITS

Though General Pitt-Rivers appears to have been the first in 1887 to suggest the use of deep pits he found in excavation were for grain storage,[1] it is only since the 1930s that archaeologists have become more consciously aware of[2] and have begun to study the practice, by both excavation and experiment.[3] The evidence runs from the Neolithic to the Iron Age, pits occurring mainly east and west of a line between the Humber and Severn estuaries, with outliers in the East Riding of Yorkshire, and in Morayshire.[4] The earlier pits are usually round or slightly oval, with a few elongated examples in Dorset and Sussex. The sides are perpendicular or inward sloping, and the bottoms are rounded or flat. Narrow-mouthed or bottle-shaped pits do not appear before the Early Iron Age. A content of 13 to 15 bushels (4.73 - 5.46 hecto.litres) has been estimated for pits in Devon with capacities of 14 to 17 cubic feet. (396 - 481 cu.deci.) Linings of leather, basketwork or clay are likely.

Early evidence from outside Britain is supplied by the classical authors Tacitus, Varro and Pliny, for the peoples of Germany, Spain, Italy and Greece,[5] and archaeologists have found pits which were possibly used in this way from around 550 B.C. in Yugoslavia, and from the 8th - 9th Centuries A.D. in the Kazar-Kaganat territory and near Kiev in the U.S.S.R.[6]

Against this background, the purpose of this note is to draw attention to the wide geographical spread of the later evidence and the considerable intensity of the use of grain-storage pits in certain areas. In the late 19th Century pits for storing sorghum and maize were used by the Matabele in Rhodesia, and the practice may go back to the 4th - 8th Centuries A.D.[7] Kanuri farmers practise pit-storage today round the shores of Lake Chad.[8] The South American Hidatsa Indians also stored squashes and maize in pits[9] and wheat, chaff, etc., was stored in pits in Turkmenistan.[10] There were more recently, experiments with underground sealed metal-lined containers in France[11] and in the 20th Century, the sealing of grain under clay domes has been recorded in Africa;[12] during the Second World War "Argentine pits" of concrete were thought of as the best way to store grain in the dry tropics, though they did not often work.[13]

The major area of their use, however, was in Central and Southern Europe. In Apulia, the Abruzzi and Sicily, storage pits were dug into cliffs and sometimes covered with flagstones.[14] Nearby, in Malta, very large pits were cut in the tufa around 1657-60 A.D.[15] From early times till the 20th Century, storage pits were known in White Russia and the Ukraine, for example, the Tatars near the Sea of Azov made pear-shaped pits dug to a man's height and this form was in wide use among the Serbs.[16] Pits were made in South Slovakia, surviving in places into the 20th Century, often by professional pit-diggers who might travel as far as Transylvania in exercise of their skills.[17] Rumania had them, possibly from Neolithic times, but certainly documented from the Medieval period

The most consistent body of information stems from Hungary. Here, pits were usually pear-shaped and lined internally with straw, or fired so that the sides became like pottery. They were dug with a shovel, spade, pit-mattock, and a basket or bucket on a rope to hoist out the material. The best soil was the "yellow-soil" or loess, which was compact, airless, and had only a limited capillary action in raising water above the water-table. The mouth of the pit required great care. It was thickened and strengthened, and provided with an air-tight cap. Grain fed into the pits had to be relatively dry. It was allo to settle for a day before being topped up and sealed in. To control the temperature, the depth of the pit was important, for the farther down, the less the seasonal fluctuation.[19]

This note is a digest of my article on Grain Storage in Pits : Experiment and Fact, forthcoming in Clarke, D.V. and O'Connor, A., ed. From the Stone Age to the Forty Five (John Donald Publishers, Edinburgh 1980). The writer would welco references to further sources of information.

ALEXANDER FENTON

Fig. 1

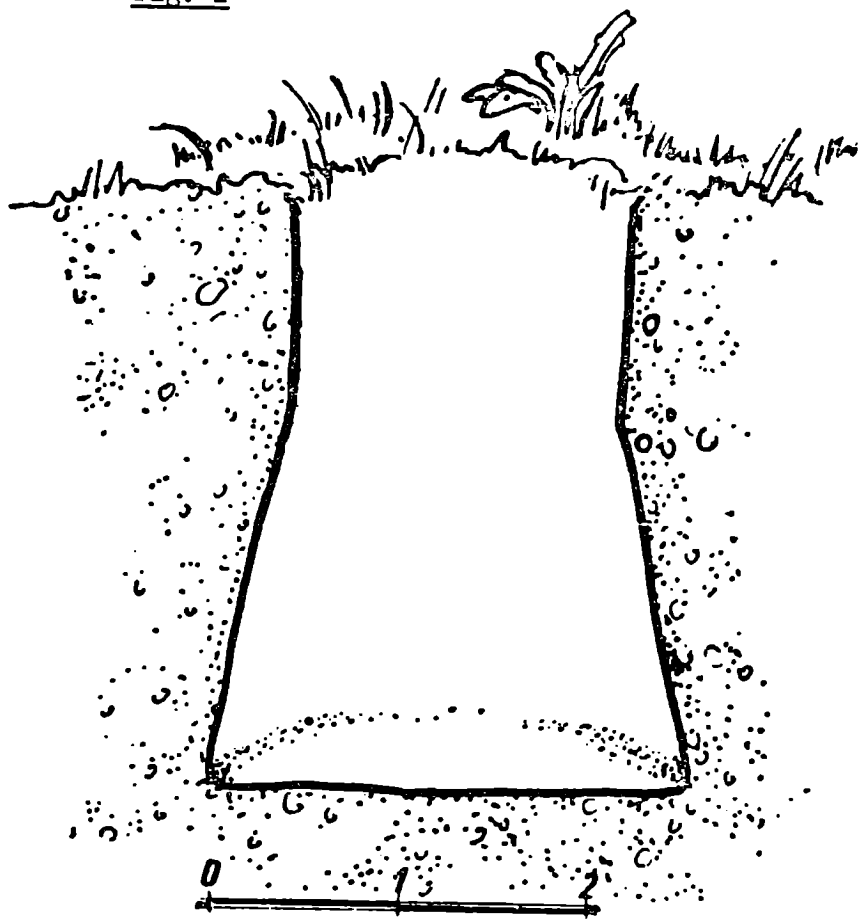
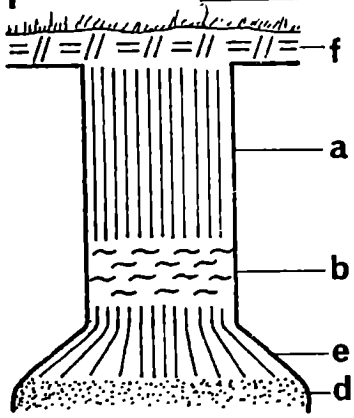
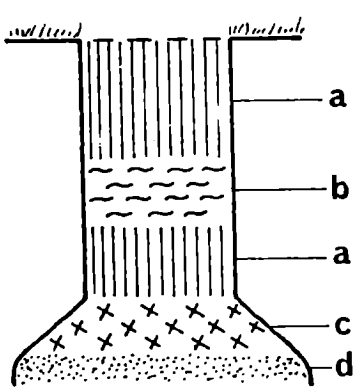


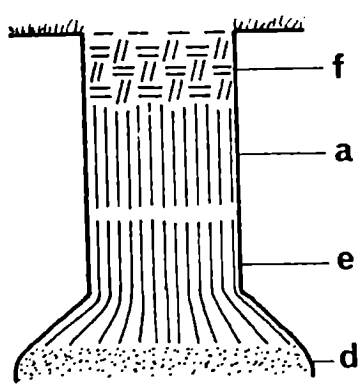
Fig. 1
A Rumanian
grain-storage pit

Ref: I. VLADUTIU
Etnografia românească
1973. p223.

Fig. 2







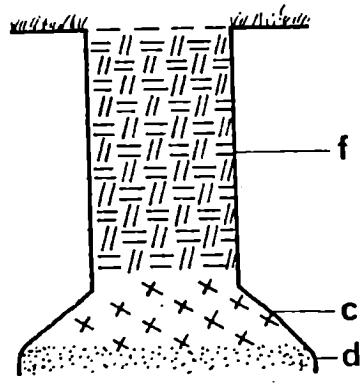


Fig.2 Materials used to seal the mouths of grain-storage pits in Hungary, in various combinations (1 - 4):

a. pounded material
b. chaff
c. sprouted grain
d. grain
e. straw
f. earth.

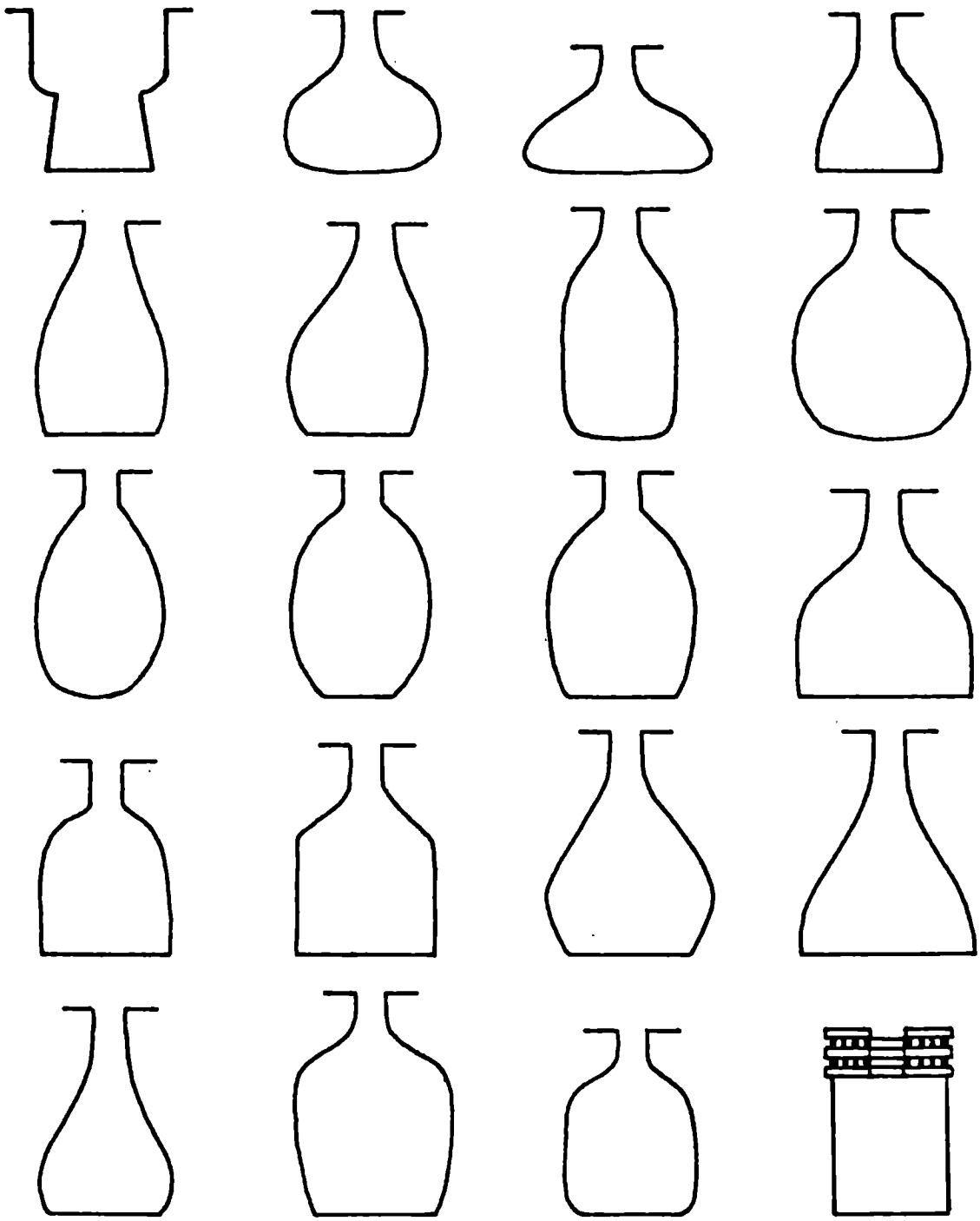
Ref: N. IKVAI, op. cit. p. 364.

REFERENCES:

1. PITT-RIVERS, A. H. Excavations at Cranborne Chase 1888. II. 55.
2. BERSU, G. Excavations at Little Woodbury, Wiltshire. Proceedings of the Prehistoric Society, 1940. VI. 30-111;
   WHEELER, R.E.M. Maiden Castle, Dorset (Society of Antiquaries) 1943. XII;
   SMITH, I. F. Notes on the Distribution of Neolithic Storage-Pits. PPS 1964 (NS) XXX. 367-381.
3. BOWEN, H.C. Corn Storage in Antiquity. Antiquity 1967. 41. 214-215;
   BOWEN, H.C. & WOOD, P. D. Experimental Storage of Corn Underground and its Implications for Iron Age Settlements. Bulletin of the Institute of Archaeology 1968. 7. 1-14;
   REYNOLDS, P. J. Experiment in Iron Age Agriculture. Trans. of the Bristol & Glos. Archaeological Society 1967. LXXXVI. 60-73; 1970 LXXXVIII. 29-33;
   COLES, J. Archaeology by Experiment 1973. 43-45
   REYNOLDS, P. J. Experimental Iron Age Storage Pits: An Interim Report. PPS 1974. 40. 118-131; Id. The Butser Ancient Farm Project. International Study Conference on the Role of Regional Ethnology in Environmental Interpretation and Education. Denmark 16-21 August 1976 Report (Council of Europe) 1976. 23-31; Id. Experimental Archaeology and the Butser Ancient Farm Research Project. Collis, J., ed. The Iron Age in Britain (Dept. of Prehistory and Archaeology, University of Sheffield) 1977. 32-40;
   Id. Iron-Age Farm. The Butser Experiment 1979. 70-82.
4. MORRISON, J. Remains of Early Antiquities, in and on the Borders of the Pari of Urquhart. Proc. of the Soc. of Ant. of Scotland 1870-72. IX. 250-263;
   YOUNG, H. W. Further Excavations at Easterton of Roseisle. The Reliquary & Illustrated Archaeologist 1896. II. 39-44, 237-241;
   WALKER, I. C. Easterton of Roseisle : a Forgotten Site in Moray. in COLES, J & SIMPSON, D.D.A., Studies in Ancient Europe 1968. 98-9, 101, 10
5. MATTINGLY, H., Trans., Tacitus on Britain and Germany 1948;
   STORR-BEST, L. Varro on Farming 1912
   WHITE, K.D. Roman Farming 1970. 189, 196-197.
6. PIGGOTT, S. Ancient Europe from the Beginnings of Agriculture to Classical Antiquity 1965. 50-51;
   TRINGHAM, R. Hunters, Fishers and Farmers of Eastern Europe 6000-3000 BC 197
   FÜZES, A. A Gabonás Vermek Problematikájához. Ethngraphia 1973. LXXXIV/4. 463-464.
7. BOWEN, H.C. & WOOD, P. D. op.cit., 3-4;
   REYNOLDS, P. J. op.cit., 1974. 119.
8. WHITE, K.D. op.cit. 197.
9. FORDE, D.C. Habitat, Economy and Society. A Geographical Introduction to Ethnology (1934) 1964. 256-257.
10. KÖNIG, W. Die Achal-Teke (Veröffentlichungen des Museums für Völkerkunde Leipzig) 1962. 12. 107-108.
11. REYNOLDS, P. J. op.cit., 1974. 119. (Quoted)
12. BOWEN, H.C. & WOOD, P.D. op.cit., 4 (Quoted)
13. WHITE, K.D. op.cit., 197.
14. SCHEUERMEIER, P. Bauernwerk in Italien, der italienischen und rätoromanische Schweiz 1943. I. 143.
15. REYNOLDS, P. J. op.cit., 1974. 119.
16. ZELENIN, D. Russische (Ostslavische) Volkskunde 1927. 54-55;
   MOSZYŃSKI, K. Kultura Ludowa Slowian (1929) 1967. I. 242-3.
17. PODOLÁK, J. Traditionelle Formen der Landwirtschaft. In HORVÁTHOVA, E. & URBANCOVÁ, V., Ed., Die slowakische Volkskultur 1972. 28-29.
18. VLĂDUTIU, I. Etnografia românească 1973.
19. BÁTKY, ZS., GYÖRFFY, I. & VISKI, K. A Magyarság Néprajza : Tárgyi Néprajz 1941. 59;
   IVÁNCSICS, N. Terménytartó vermek Berettyószentmártonban. Debreceni Déri Múzeum Évkönyve 1958-9 1960. 111-125;

IKVAI, N. Földalatti gabonatárolás Magyarországon. Ethnographia 1966 LXXXVII/3. 343-377.
KISS, L. & PATAKI, S., edd. Mezőcsáti Hely történeti Füzetek 3. Mezőcsát Népi Kulturájából 1971. 88;
FÜZES, A. op. cit., 1974;
DARU, L. A Nagy-Sárrét Népi Építészete (Műveltség es Hagyomany XVII) 1975. 136-141.

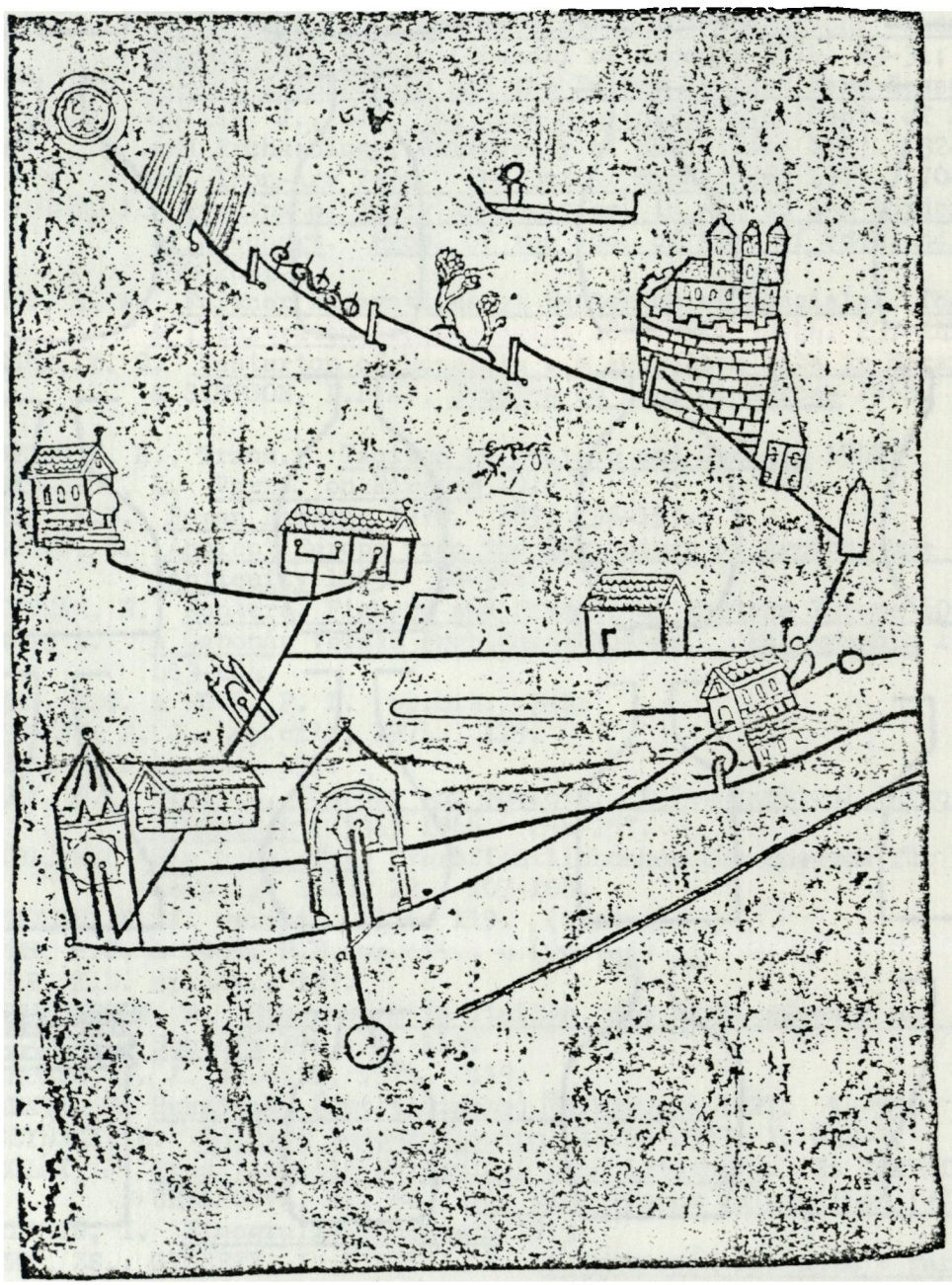
SHAPES OF GRAIN-STORAGE PITS IN HUNGARY Fig. 3



Ref: N. IKVAI - Földalatti gabonátarolás Magyaroszágon, in Ethnographia 1966. LXXVII/3. p. 363.

About 100 years after the Norman Conquest a grant of land containing water springs was given to the monks of the Cathedral Priory of Canterbury. A system of supply was constructed, a diagrammatic plan of which is reproduced below.

Close to the springs was a circular conduit house which supplied water to the city wall via five reservoirs or settling tanks. It was then piped to the laver (a raised cistern which trickled water down into a wash basin) in the infirmary cloister and onto the laver in front of the refectory. From here one pipe ran north under the refectory, scullery and kitchen, supplying each by means of stand pipes, then across the court to the bake house, brew house, and guest hall, with a branch to the bath house. A second pipe from the refectory laver ran to another laver in front of the infirmary hall, with a branch running south under the church to a tank in the lay folks cemetery probably for the use of the townspeople.



DIAGRAMMATIC PLAN OF WATER-SUPPLY, CHRIST CHURCH, CANTERBURY *c.* 1167

Waste from both these branches ran into a stone 'fish pond' each of the Church. A pipe then ran to a tank by the Prior's chamber where it was joined by waste from the bath house and flowed into the main drain running through the reredorter. This drain, 'The Great Drain' also carried rain water from the great cloister and from the roofs of the church buildings. It went across the court and under the city wall into the city ditch.

The system was very sophisticated and had a number of purging pipes and stopcocks to enable sediment to be flushed away.

ROD LE GEAR

(Summarised from L. F. SALZMAN Building in England down to 1540 (1967) 2nd Ed.)

THE GREAT DRAIN

Very little is known about the Great Drain and on the north side of the Cathedral, its course has not been traced with any certainty. Dart's History of the Cathedral (1726) merely says that it was repaired by Priors Goldstone and Chillenden before the Reformation. The Dean and Chapter kindly gave me permission to investigate this drain, on the 18th April, 1979.

The Great Drain started at a conduit house which stood a little way beyond the present day wooden Cathedral gift shop. It passed west in front of the present houses and then, in front of the south-west porch (the main entrance for visitors) it began the circuit of the Cathedral a few yards out from the wall. Latterly there have been problems of damp, and here a large pit was dug in 1978, exposing the Drain just below the turf. There are square holes in it at intervals which the Clerk of the Works suggests allowed surface water to seep into the Drain, in the manner of land drains, which are laid end to end without actually being joined together.

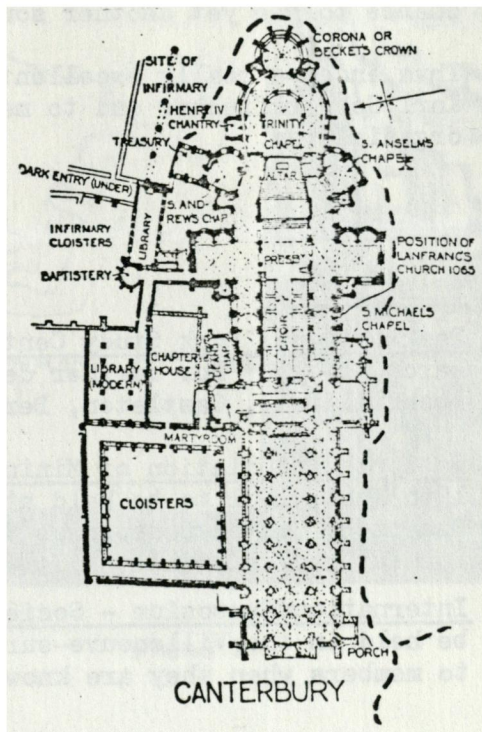
The only places where access can be gained are in the Kings School quadrangle on the north side of the Cathedral. One manhole lies by the old city wall and gives access to a round sump of 35 cms. in diameter approximately, down which the water finally passes. From here it is possible to crawl along the Drain for about 117 m. It runs from the north-east across the quadrangle and there is another manhole halfway across this quadrangle. The Drain is 3.04 m. down at the far end and 2.438 m. at the intervening manhole.

It is not possible to show on this small map the full extent of the drain examined.

x shows the exposed drain.

---course of the drain.

Illustration taken from
SIR BANISTER-FLETCHER
English Medieval Architecture
Batsford, London. 1943. p. 361.



The Great Drain (Cont'd)

An exploration from the middle access (see Photo 1) was carried out for 24 m. before reaching another manhole, the cover of which was impossible to prise up and proved to be covered in tarmac. Here the 12th Century stone work ended in what seemed fairly modern brickwork and the water came from a 30 cms. diameter pipe on the east side of the manhole. Somewhere this recent pipe must change back to the 12th Century work but no other manholes are known; the foreman of the Cathedral repair shop, who has worked there for over thirty years, had no information on the subject.

Having gone as far as possible towards the Cathedral, we went back and explored in the direction of the city wall. This became very nasty, as instead of the former 30 cms. of wet muddy silt, it became progressively more silted until we were crawling along on our stomachs using elbows to move along !

We then went and investigated the third manhole with a drainage sump. Here the silt was 30 cms. thick. The area is very extensively repaired with Tudor brickwork resting on the original stonework. This brickwork probably starts somewhere between the War Memorial and the end of the Drain, perhaps where the original 12th Century work had collapsed and where the Priors of the monastery did their repair work. The Drain nearer the Cathedral appeared to be the original stone structure - ragstone blocks cemented together.

A ledge can be seen in the photograph (see Photo 2) and water had evidently been flowing up to this level not long before.

My companions for this exploratory work were Roger Blackman and John Vigar.

MICHAEL JACK

International Symposium, Roding (Cont'd) from page 2.

On Saturday night we were entertained by the Mayor of Roding to an excellent meal at the Haus Ostmark. On Monday we paid a visit to Falkenstein Castle for the Bastille Day dinner - the high-light of the weekend for many - where Sylvia Beamon, Chairman of Subterranea Britannica, and Serge Avrilleau, President of Societe Francaise D'Etude des Souterrains, were both presented with an emblazoned pewter dish for their respective societies.

On Tuesday most departed but for a few fanatics who stayed on as there was a chance to see yet another souterrain.

Thus ended a really excellent four days - the credit for which must go to Karl Schwarzfischer and to members of the German society for the splendid organisation.

PHIL MARSHALL

DIARY DATES

Peak National Park Study Centre. Mines of the Peak District Course 6th - 8th March, 1981. For further details contact Peak National Park Study Centre, Losehill Hall, Castleton, Derbyshire S30 2WB. Tel: Hope Valley 20373 & 20693.

National Association of Mining History Organisations. Biennial Conference 12th - 15th June, 1981 to be held at the Ironbridge Gorge Museum, Telford. Contact Stuart B. Smith, Conference Secretary, The Wharfage, Ironbridge, Telford, Shrops. for further information. Tel: Ironbridge (095245) 3522.

International Symposium - Société Française D'Étude des Souterrains: July, 1981 to be held in the Villeneuve-sur-Lot area of France. Further details will be sent to members when they are known.

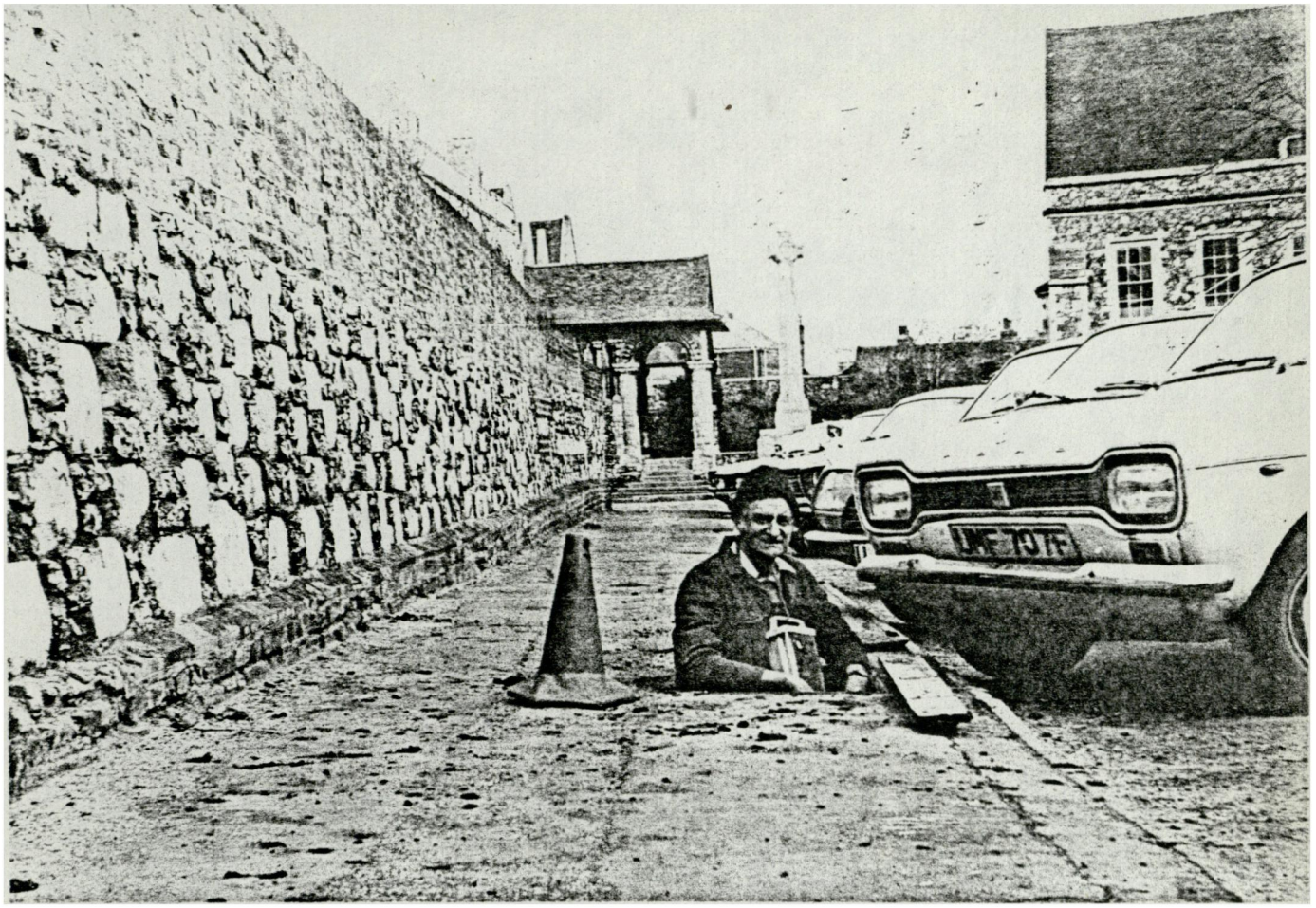


Photo 1

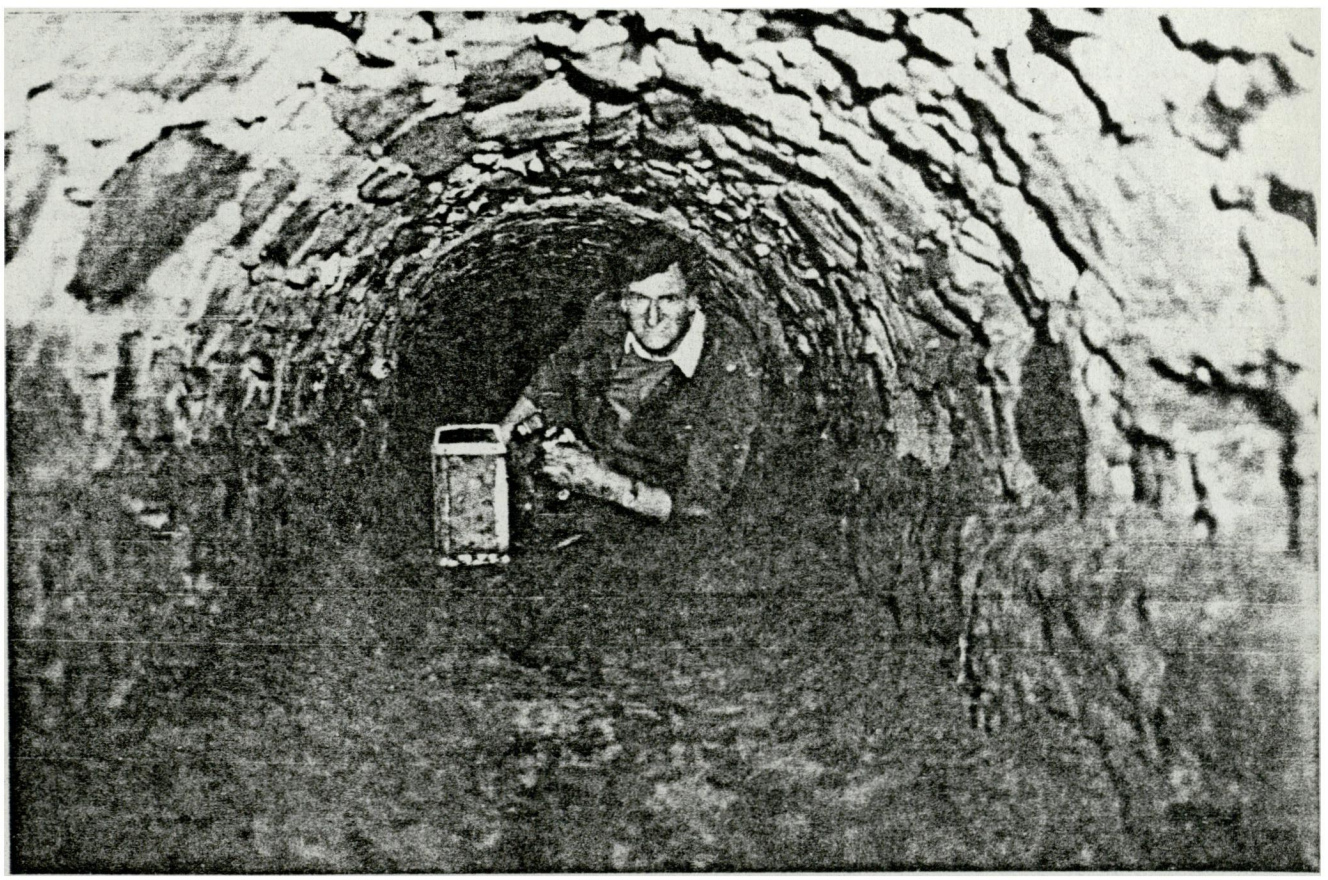
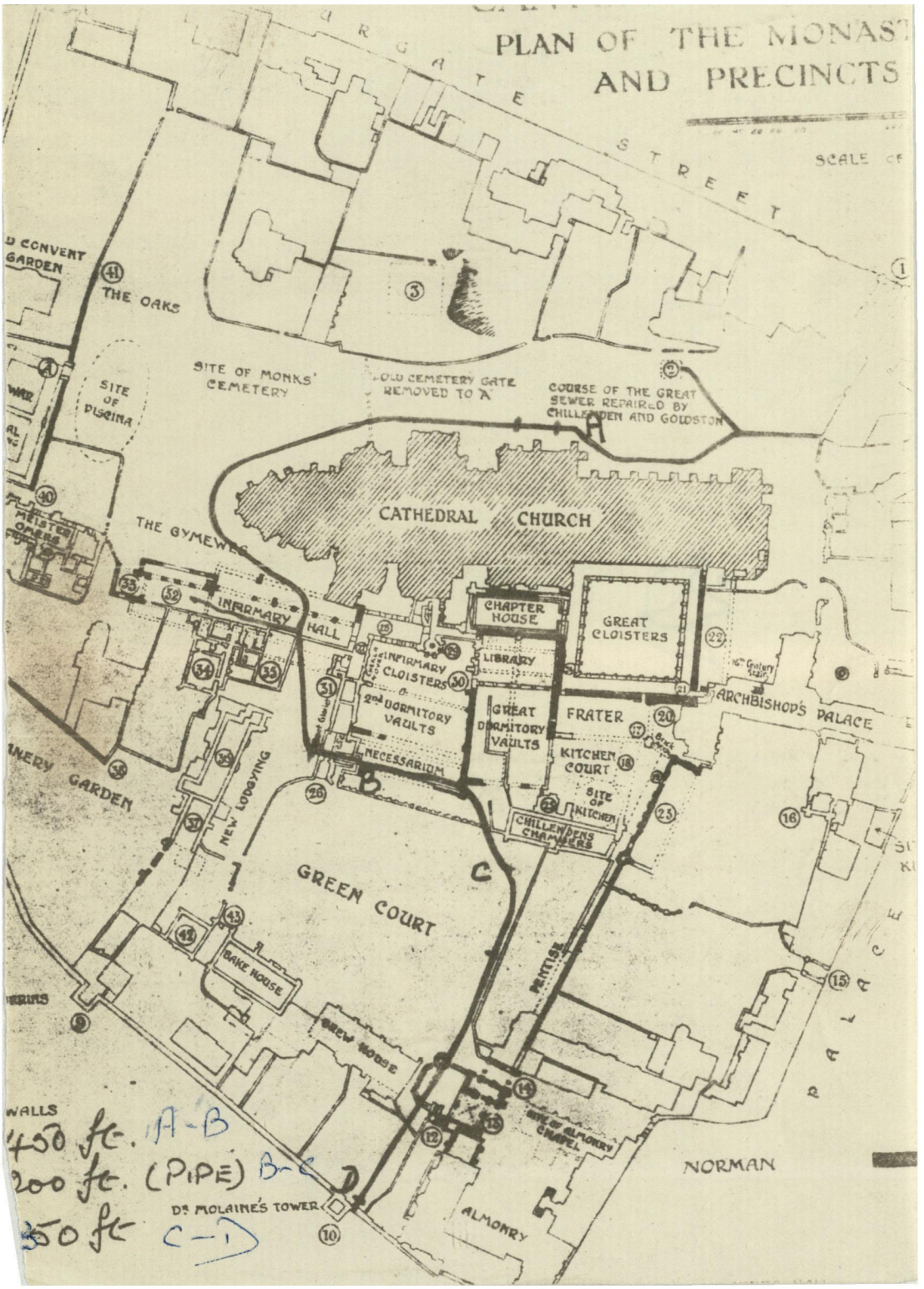


Photo 2


PLAN OF THE MONAST
AND PRECINCTS
SCALE
ST
THE OAKS
SITE OF MONKS' CEMETERY
SITE OF PISCINA
OLD CEMETERY GATE REMOVED TO A
COURSE OF THE GREAT SEWER REPAIRED BY CHILLENDEN AND GOLDSTON
CATHEDRAL CHURCH
THE GYMEWES
INFIRMARY HALL
CHAPTER HOUSE
GREAT CLOISTERS
LIBRARY
INFIRMARY CLOISTERS
2nd DORMITORY VAULTS
GREAT DORMITORY VAULTS
FRATER
ARCHBISHOP'S PALACE
KITCHEN COURT
SITE OF KITCHEN
NECESSARIUM
CHILLENDENS CHAMBERS
NEW LODGYNG
GREEN COURT
BAKE HOUSE
BREW HOUSE
PRISON
SITE OF ALMONRY CHAPEL
ALMONRY
NORMAN
PALACE
WALLS
1450 ft. A-B
200 ft. (PIPE) B-C
350 ft C-D
Dr MOLAINE'S TOWER